FIELD-WORK AND NATURE-STUDY
PART II
THE PEDAGOGICAL ASPECT

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The point which I have tried to make is that in our attempts to teach from nature the chief sources of weakness have been: (1) our failure to appreciate the true mental attitude of the child toward his nature environment; (2) Our failure to incorporate the child's normal attitude and personal interests into our teaching procedure; (3) Our belief that the act of educating is to be accomplished by some form of step-by-step procedure through a series of lessons selected and adapted with reference to communicating to the child a certain fund of knowledge which we believe essential for him to know. Our attitude of mind is that of considering nature-knowledge as something to be learned through conscious effort; something to be acquired mainly through sheer force of will, aside from any feeling of desire or need; something to be communicated to the child through a series of logically selected and arranged lessons or topics instead of considering it as something to evolve normally out of living. We present nature to the child as a mass of fragments, as consisting of innumerable facts and details, instead of a great unit of related parts. Whether the school shall appear to the child as something normal to life or something which adults have imposed upon him to prepare him for life, a preparation for which he feels no need, depends very largely upon whether his school activities include his own personal interests and impulses or whether he meets his work as something imposed upon him. Education is as much a matter of the mental attitude of the learner as it is of subject-matter; the two things are interdependent. The quality of knowledge, the mind's interpretation of the fact, depend upon the mental

attitude of the individual at the time the fact enters the mind. The strongest associations are related to our spontaneous activities and mental attitudes. A falling meteor may be to us a sign from heaven or a fragment from another world, depending upon our mental attitude whereas in reality it may be neither. The child will put his own construction on the work we try to have him do in spite of us; whether we enlist the whole of the child in the work which we are trying to do in teaching or but a part of him depends upon how closely our methods of teaching are in accord with his mental attitudes. If our work is to be effective we must prepare the mind for the knowledge which it is to receive, and the individual's free response to his environment is one of the strongest factors in this preparation. The interest of the classroom must be able to match the interests of the streets and playgrounds if we expect to get the best results from the children. It is because of its richness, and its ability to cope with these other environmental influences that field-work claims a place in our school work.

One result of broad-sense experience is to retain plasticity in mental attitude; if the mental attitude of the individual evolves out of his own experiences it will remain plastic and keep in adjustment and harmony with increase in experience; if however, it is the product of accepted dogma or statement, something based on a statement of authority, teacher, or text-book, the mind becomes set and excludes all possibility for growth in that direction. In this matter of teaching we need to distinguish between static knowledge and dynamic knowledge. That six fours are twenty-four is a static fact; we cannot conceive of a time when it was anything to the mind but twenty-four, or of a time when it will be to the mind anything but twenty-four, and the sooner the child gets that fact fixed in his mind, when he is ready for it, the better. The fact as to the cause of variety in living forms is a different matter; it is the result of special creation, of evolution, of adaptation to environment, of survival of the fittest, of mutation—it is whatever the mind in the light of its experience conceives it to be.

In time the mind will conceive the explanation as it really is

and it will become a fixed fact, static as the fact that six fours are twenty-four.

We can cast a prophet eye into the future and conceive of a time when the mind shall have discovered all of the final facts pertaining to this earth, when all knowledge has become a static, and the mind, having exhausted the possibilities for growth, ceases its growth and proceeds to operate in some formal routine method to retain these eternal truths. But until that time arrives let us store up our knowledge, the real and the false, in reservoirs of books, and bring our efforts to bear upon bringing the child mind into rhythmic swing with the movement essential to real growth. It is to effect this that we need to bring our school work into close harmony with the spontaneous attitudes and interests of the child and to bring the whole into close contact with the realities of things in nature. It is this "abysmal difference between learning about nature and learning from nature" which we must appreciate before nature-study becomes really effective.

The general sentiment among parents and teachers seems to be that all time is wasted for children which is not spent in taking in consciously some special idea or fixing in the mind some fact, which the adult understands or thinks he understands. Some of the most successful field-excursions which I have observed, successful because of the multitude of new and rich experiences which came to the pupils and the spontaneous interest and delight with which they received them, were dismal failures in the minds of parents because the children were more conscious of the pleasures of the day than of the number of facts learned. On the other hand these same excursions have been considered of great value by adults whose spirits were never touched or quickened, who were impressed by the facts as they were pointed out, who remembered what was said, interpreted nothing, but went home with a fair collection of artificially received facts, but with a satisfied feeling of a duty well performed. Mrs. Boole's statement: "It is curious and painful to observe how many things have been proposed by true educationalists, simply for the purpose of administering to the uncon-

scious mind and afterwards perverted, by persons possessed with the teaching mania, to the purpose of stuffing into the children's minds some idea which is in the teacher's mind," [1] is extremely pertinent in the matter of nature-study.

"The region of nature is for the child, as for savage and ignorant man, a domain of mystery and fancy." It should be the aim of the teacher to aid the child in establishing such relation with nature and its various manifestations that the reasonableness of things will appear. To the child the whole domain of nature is both strange and meaningless; to the city child the growing tendency is that it shall remain strange and meaningless. It should be the aim of field-work to aid the child to gain an acquaintance with the objects and phenomena of nature, to discover relationships, to know the things of nature as they actually are, to have nature appear to him in her reality; and above all the study should become a personal matter to the child. It should aim to turn strangeness into familiarity; convert meaningless things into things alive with meaning; it should replace fancy and mystery with reason and intelligence. Nature-study was introduced into the schools to aid the child to make this transition; to aid and direct him in gaining the personal experience essential to the transition; to assist him in accumulating, arranging, and interpreting these experiences so that the realities and truths of nature will appear; and out of the effort and activity involved should evolve adequate knowledge and power. If our own knowledge of nature has any purpose or value, it is to give us breadth of view that we may guide wisely in this matter of nature-teaching; it is surely not to be used for "stuffing" purposes. It seems that if there is any type of school work in which we should be able to move with directness of purpose it should be in this matter of nature-study.

The reasonableness, relationships, and truths of nature have always been present and constant. Nature was the same in the days when man believed this to be a flat stationary earth formed by special creation as she is today under the conception of a revolving earth and evolution. Much that is knowledge today,

[1] *The Preparation of the Child for Science.*

was the unknown of yesterday, and will be the false impressions and traditions of tomorrow. These changes are wholly a matter of human mind, brought about by a more extended and minute acquaintanceship with nature; of growth in mental power in the selection and arrangement of the relevant and irrelevant, until things finally appear to the human mind in exact or approximate accord with their appearance and action in nature.

Whatever we can sense we can understand in sense terms. Our first lessons should aim to give children ample opportunity for acquiring a wide range of sense impressions to teach them to rely upon the integrity of their senses, and to aid them in expressing with clearness this sense knowledge. There will be ample time and opportunity, later, for them to discover that the senses of individuals vary, that they do not all receive the same quality of a sensation, and that there is frequently a difference between a sense impression and a scientific fact; that what is color to the eye is as a scientific fact vibrations of light. After he has made adequate use of his senses, when he meets something that is too minute for the eye to sense, and the need arises, let him use the microscope and see how we have reinforced the senses with the lens. It is only by some such method that the child will come to value knowledge and appreciate human progress.

Nature-study demands that we give children ample opportunity to deal with the actual objects and phenomena of nature instead of compelling them to submit to talks and literature about nature. It asks that as teachers we try to understand the mental attitude of the child which results from his contact with nature, to understand what determines or controls mental attitude, and to acquire power to direct the activities aroused; rather than compel the child to gain our view-point by following in some routine way our directions. "Either method of study may have outwardly the true logical form but it is the former that is really educative."

Field-work claims a place in nature-study as a means for enriching the child's sense experience as opposed by the poverty

of the schoolroom; as furnishing ample range of valuable subject-matter from which to satisfy natural curiosity from which to choose according to interests and needs, as opposed to no choice in the matter except to attend to the work which the teacher has chosen and assigned; as offering freedom to physical and mental activity as opposed to suppression. Nature has given us every aid in this whole matter through the sensitiveness of the child to his surroundings and his insatiable curiosity. We have thwarted her at her first step in the matter by over-confinement of the child, at his most sensitive and receptive period, to the barren schoolroom. It is but what should be expected that the plea (and practice) to keep children out of our city schools until they have reached the age of eight or ten should be growing.

THE TEACHER'S OUTLOOK INTO FIELD-WORK

Field-work should begin with a comprehensive survey of the landscape as a whole. We should seek for some underlying unity which binds the whole into a balanced organism. Something which makes the topography, rocks, plants, and animals, in spite of variety, as much a part of this landscape organism as the leaves, twigs, and roots are parts of the plant organism. Our outlook into the landscape should be with a view to comprehending the whole of it, just as our study of the plant should be with a view to comprehending it as a whole. In proceeding from the landscape as a whole to its details of contour, mineral, and life, the study of these things should not become fragmentary and isolated, something apart from the landscape organism, any more than a study of leaves, twigs, roots, flowers, and fruit should become fragmentary and appear to the mind as something apart from the tree as a whole; the one set is as much an organic part of the landscape as the other is an organic part of the tree. If the landscape has a special form of topography there is a reason for it, and it is that reason which we seek; if a tree has a special form there is a reason for it and it is that reason which we wish to understand. If the landscape has a particular mineral formation, there is a reason for it; if a tree

has a peculiar leaf form or its seeds float through the air supported by a parachute of down, there is a reason for it; if vegetation is absent on an area, or we find plants without leaves there are reasons and it is these reasons for which we seek. Each set, collectively or individually, has its greatest value when seen in true relation to the whole, in its sequence of relations. In our study of our landscape environment we should seek for the dominant influence which organizes it into a great unity. This will usually be found to be some great physical event which modeled the contour of the landscape, distributed its minerals, determined its basal physical characteristic, and in so doing predetermined, directly or indirectly, all subsequent events within the area.

In our Chicago area this predetermining agent has been the lake; everywhere the region bespeaks the characteristics given it by the lake. Its ridges of sand and pebbles bespeak sandbars and spits, and on them grow the oaks; its marshes tell of barriers and inclosed lagoons, and in them have gathered a host of plants and animals adapted to a water environment. Both ridge and swamp may be traced directly to the action of the water of the lake, working under different conditions, and out of the different landscapes developed have come this difference in life. Acorns, doubtless, came to both lagoon and ridge; but only those which were dropped on the ridge grew; the seeds of the flags dropped on ridge and lagoon; but only those of the lagoon grew. The squirrels came to feed upon the acorns and live on the ridge, while the muskrats found food in the roots of flags and inhabited the swamp. To acquire the experience, and to develop power of mind in selection and arrangement, essential to having our environment appear to us as it is, to interpret the present so as to decipher the past and forecast the future—this is the fundamental purpose of field-work.

UNIT ENVIRONMENTS IN FIELD-WORK

In the evolution of the earth its surface has been modeled and molded by the forces of diastrophism, vulcanism, and gradation into great mass landscapes known as to size as conti-

nents and islands, as to elevation, as mountains, plateaus, plains. Within these mass landscapes, composing their surface are a number of minor physical regions known, according to their genesis, form, or content, as:

1. Shores and beaches of various forms with their associated features.

2. Lakelets, lagoons, marshes of various forms with their associated features.

3. Gullies, ravines, valleys of various forms with their associated features.

4. Hummocks, hills, and ridges of various forms with their associated features.

5. Levels and flats with their associated features.

Each of these type regions may be considered as a unit environment, containing its own combination of physical condition which controls the area, and unifies the various materials and phenomena within the area. The swamp is different from the ridge and both differ from the beach. Within these regions are to be found minor physical regions, such as cause zonal distribution in the marsh plants, so that we find an inner zone of water lilies, an internal zone of flags, and a border zone of sedges. A complete study of any of these type areas should lead to an acquaintance and an intelligent appreciation of the various objects and phenomena in the region, their true relation to the region as a whole, their interdependence, and the factors which control their presence, habits, and positions.

The mental content resulting from the general and detailed study of each type should, to a degree, correspond to the true facts pertaining to the region. If the action of a certain force or forces has molded the contour of the land surface of the area, and this contour has given rise to a variety in physical conditions with reference to moisture, temperature, light, air (wind), and these in turn exert control over the presence and distribution of its content of plant and animal life, then field-work should effect in us a mental attitude of recognition and appreciation of these mutual relations.

By ignoring this unity, in our treatment of subject in ele-

mentary-school work, by presenting these various phases as isolated subjects in physiography, botany, zoölogy, etc., instead of maintaining their unity through a study of the landscape itself, we have greatly reduced the effectiveness of our nature-study and science teaching and this, combined with our indoor study, has been the main reason why nature-study and elementary science have failed to exert that influence upon education which was promised by their advocates. Our problem is no longer a matter of subject-matter, it is a question of co-operation in aiding the mind to deal with the subject so abundantly at hand; of presentation and treatment in accord with the psychic stages and mental attitudes. The statement so frequently made, that teachers are not sufficiently prepared to teach nature-study and elementary science, hence their failure, is only true when we admit with it that this is not so much on account of lack of effort in the study of subject as it is that of mental attitude induced through the study.

A common type region of the Chicago area is the marsh. Something of the richness and attractiveness of this area is indicated by the number of visits which it receives annually from physiographers, botanists, zoölogists, flower-pickers, hunters, wandering children. Each comes for a special purpose; the physiographer to determine its genesis and subsequent changes; the botanist is attracted by the variety, distribution, and habits of its plants; the zoölogist by its animal life; the hunter has an eye to snipe and duck; the flower picker seeks for orchids and water lilies; to each of these the marsh is not a unit but a place where certain problems may be solved or certain things found, and they observe the things essential to their needs. The wandering children, however, approach the marsh without any prejudices, open minded, ready for any attraction the place may offer; they come with the attitude of true explorers and investigators, stirring up the ooze, splashing in the water, peering through the reeds, wading for water lilies, catching frogs, seeking for birds, alert to every sight and sound, reveling in the richness of their new experiences.

The teacher who approaches a region with her class needs to

do so in the same comprehensive way, needs to include the whole of the marsh in order to include the entire range of children's interest in the area. We may assume that from the standpoint of subject-matter an outline as follows would include this comprehensive survey.

1. Examining the area in order to gain a fairly clear impression of the general physiognomy and atmosphere of the marsh. (This impression may be expressed in a sketch or painting of the marsh or of a typical portion of it.)
2. Examining the area to determine the genesis of the marsh, and to determine the nature of the force or agent which formed it.
3. Imaging the appearance of the region at the time the marsh was born, and the changes, and the reasons for them, which the marsh has undergone since its genesis to the present time.
4. Getting acquainted with the plant life of the marsh: (*a*) variety of plants and their identification; (*b*) their zonal distribution and the factors determining this distribution; (*c*) the structures and habits of these plants which fit them to their zones; (*d*) the influence of this plant life upon the marsh.
5. (*a*) Gaining an acquaintance with the animal life of the marsh, identification, something of its habits and life history; (*b*) factors which have attracted this animal life to the region and which control its presence and distribution; (*c*) how this life reached the area; (*d*) the influence of this animal life upon the marsh.
6. Economic aspects of the region.
7. The ultimate death of the marsh and the way it may be brought about.
8. The story of the succession of changes which take place in a marsh during its birth, growth, and decline. To see the region as a place of slow action, something dynamic instead of static; to see one wave of change follow another toward the center of the area until grass land occupies the spot where water lilies grew and sparrows and field mice take the place of ducks and frogs.

It is safe to assume that the elementary student gives little attention or thought to the problems outlined. The things that appeal to him are the mud, the cat-tails, lily-pads, tadpoles, frogs, and crayfish; how the marsh got there, from whence these things came and whither they are going does not trouble him. It is sufficient that they are there and he sets to work to get all of the experience and pleasure, by observation discovery, experimentation, and collecting, which the place offers. The region as approached by the child gives him little hint of the problems

outlined; these are conceptions to be evolved out of his experiences in the marsh. Our main problem is so to direct and aid him that when the time arrives he will have the sense, data, and experience out of which to construct the complete story of the region. Our success in directing will be quite largely determined by the way in which the subject is organized in our own mind and our mental attitude toward the act of teaching.